

# Planting

SUMMARY OF INSTRUCTIONAL ACTIVITIES



## 🔍 **Plant Structure & Adaptation** - page 5

- 🕒 ▶ Students locate and study a flowering plant on their school grounds.
- ▶ Students describe the plant and label the parts of the plant.
- ▶ Students discuss pollination and plant adaptation.
- ▶ Students use the Plant Guide on the National Park Labs web site to categorize plants by adaptation or structures.

## 🌱 **Planting** - page 10

- 🏠 ▶ Students examine and describe for other students the adaptations of various indigenous plants.
- ▶ Students participate in the restoration of an area by planting native plants.
- ▶ Students write a journal entry comparing characteristics of two more native plant species. (integrated assessment)

## 🖱️ **Plant Quilt** - page 16

- 🕒 ▶ Students use the Plant Guide on the National Park Labs web site and additional resources to create a multicultural depiction of plants and plant uses.

## 🌱 **Creating a Community Garden** - page 18

- 🕒 ▶ Students choose and measure an area of their school grounds as a proposed site for a community garden.
- ▶ Students consider who will have access to the garden and who will take responsibility for its day-to-day upkeep; determine the number, type, and placement of plants; propose funding sources.
- ▶ Students write a detailed proposal to create this garden and submit the proposal to their school's principal.

# Standards

## Planting

### **SFUSD Science Content Standard 11: Structure and Function**

Students understand that different species of living things have analogous structures that carry out similar functions, contributing to the continued viability of organisms in their specific environments.

- ▶ *Performance Standard:* Students should be able to compare and contrast characteristics of various plant species showing similarities by function. (based on SFUSD Performance Standard 11.1)

### **National Behavioral Studies Standard 1: Group and cultural influences over human development, identity and behavior**

Students understand that heredity, culture, and personal experience interact in shaping human behavior.

- ▶ *Performance Standard:* Students understand that views about plants and nature are shaped by culture and personal experience.

### **National Life Skills Standard: Life Work**

Students learn the proper use of new instruments by following instructions in a manual or by taking instructions from an experienced user.

- ▶ *Performance Standard:* Students should be able to demonstrate the proper use of picks for planting and discuss several safety measures that should be observed when using tools.

# Revegetation

To revegetate means to provide an area with new plant cover. In the Golden Gate National Recreation Area, revegetation usually refers to placing indigenous plants in areas from which park staff and volunteers have removed invasive, exotic plant species.

Why is it necessary for park staff to revegetate restoration sites? Why not just remove invasive plants and then let natural ecological processes revegetate the area gradually over time? Although this is the preferred option, it takes many years for an area to revegetate naturally. The site must be visited repeatedly to prevent the establishment of exotic invasive species that may out-compete native seedlings. Additionally, many disturbed areas no longer have a native seedbank remaining in the soil. Growing plants in the nursery and introducing them into an area when they are relatively mature, or sowing seeds directly on-site, helps resource managers speed up the natural process. The indigenous plant community will reach a state of resiliency more quickly, and provide habitat for other members of the ecosystem. For example, by introducing mature silver lupine (*Lupinus albifrons*) to a site such as Milagra Ridge, park staff are able to provide much-needed habitat for the endangered Mission Blue butterfly.

## REVEGETATION METHODS

Planting and direct seeding are the two methods used in the park to revegetate restoration areas. Planting involves transplanting seedlings that have been raised in the nursery and are already relatively mature. Direct seeding entails sowing seeds on-site and letting them germinate and develop naturally.

Propagules (seeds and cuttings) for propagating plants at the nursery or for direct seeding are gathered from the restoration site or from the immediate area. It is preferable to collect propagules as close to the site as possible because the genotype (genetic makeup) of plants can change within a very short distance. Sometimes seeds or cuttings of the required species are not available in the immediate area and must be gathered from farther away. As a general rule, however, it is best to gather the propagules within the boundaries of the watershed in which the restoration site is located.

# Restauración de la Vegetación

Restauración de la vegetación o reforestar quiere decir proveerle a un área una nueva cubierta de plantas. En el Área Nacional Recreativa Golden Gate reforestación usualmente se refiere a colocar plantas indígenas en área donde el personal del parque y voluntarios han removido especies de plantas exóticas invasoras.

¿Por qué es necesario que el personal del parque restaure la vegetación de lugares particulares? ¿Por qué no simplemente remover las plantas invasoras y dejar que el proceso ecológico natural le devuelva la vegetación al área gradualmente según pasa el tiempo? Aunque esta es la alternativa preferida, le toma muchos años a un área recobrar la vegetación de modo natural. Un lugar así tiene que ser visitado repetidas veces para prevenir el restablecimiento de especies exóticas invasoras que puedan derrotar las semillas nativas. Por otra parte, muchas áreas afectadas ya no cuentan con la presencia de un banco de semillas en su terreno. Cultivar plantas en el vivero e introducirlas a un área cuando ya están relativamente maduras, o sembrar las semillas directamente en el lugar, ayuda a los manejadores de recursos a acelerar el proceso natural. La comunidad de plantas indígenas se hará resistente más rápidamente y proveerá hábitat para otros miembros del ecosistema. Por ejemplo, introduciendo el lupino plateado (*Lupinus albus*) ya maduro, a un lugar como la sierra Milagra Ridge, el personal del parque logra proveer el hábitat que tanto necesita la mariposa Blue Mission, que está en peligro de extinción.

## MÉTODOS DE RESTAURACIÓN VEGETAL

Los dos métodos utilizados en el parque para devolverle la vegetación a las áreas de restauración son, replantando y sembrando semillas directamente. Replantar consiste en transplantar las semillas que han germinado en el vivero y que ya están relativamente maduras. Siembra directa consiste en sembrar las semillas en el lugar y permitirles que germinen y se desarrollen naturalmente.

Las semillas y estolones (propagules) que se utilizan para propagar plantas en el vivero o sembrándolas directamente, son recogidas del lugar de la restauración o de los alrededores. Es preferible recoger propagules lo más cerca posible del lugar, porque el genotipo (la estructura genética) de las plantas puede ser diferente a distancias muy cortas. Algunas veces las semillas o los estolones de la especie requerida no están disponibles en el área cercana y deben ser recogidos en un lugar más alejado. Por lo general, sin embargo, es mejor recoger propagules dentro de los límites de la corriente de agua donde se encuentra el lugar de restauración.

## **Plant Structure & Adaptation**

### **SUMMARY**

Students draw and label the parts of a flowering plant. They use the Plant Guide on the National Park Labs web page to compare and group plants according to the plants' adaptations.

### **TIME**

Two 50-minute class periods  
10 minutes for preparation

### **MATERIALS**

- Plant Structure Worksheet
- On the second day of the lesson, students will need computers with Internet access

## **Lesson**

### **Day 1**

25 minutes

Students locate flowering plants on or near their school grounds.

Students examine the plant and describe the texture and color of the leaves, stem, and petals.

Students draw the parts of the flowering plant, including each of the following structures:

- a. Roots
- b. Stem
- c. Sepals
- d. Petals
- e. Pistil (stigma, style and ovaries)
- f. Stamen (filament and anther)

15 minutes

Students complete the Plant Structure Worksheet by labeling the parts of the flowering plant, matching the parts with their functions, and describing the process of pollination.

10 minutes

Teacher leads a discussion about flowering plants:

- What role do insects play in the process of pollination?
- What type of insects might visit your plant for food?
- Why?
- How do leaves help you determine which plants use a lot of water?
- How have flowering plants adapted to survive?

## **Day 2**

10 minutes

Students access the National Park Labs web site and find the Plant Guide.

40 minutes

Students create a chart that categorizes and sorts the plants in the Plant Guide.

Students create their own categories and organization for the chart, using at least five different categories.

# Plant Structure Worksheet



Directions:

1. Locate a flowering plant near your school. Examine the textures and colors of the leaves, stem and petals of the plant. Complete the following.

- Draw and label the plant in the box below.
- Match the part with its function on the left.

\_\_\_\_\_ where photosynthesis occurs

\_\_\_\_\_ develops into a fruit

\_\_\_\_\_ absorb nutrients

\_\_\_\_\_ receives pollen

\_\_\_\_\_ supports the flowers and leaves

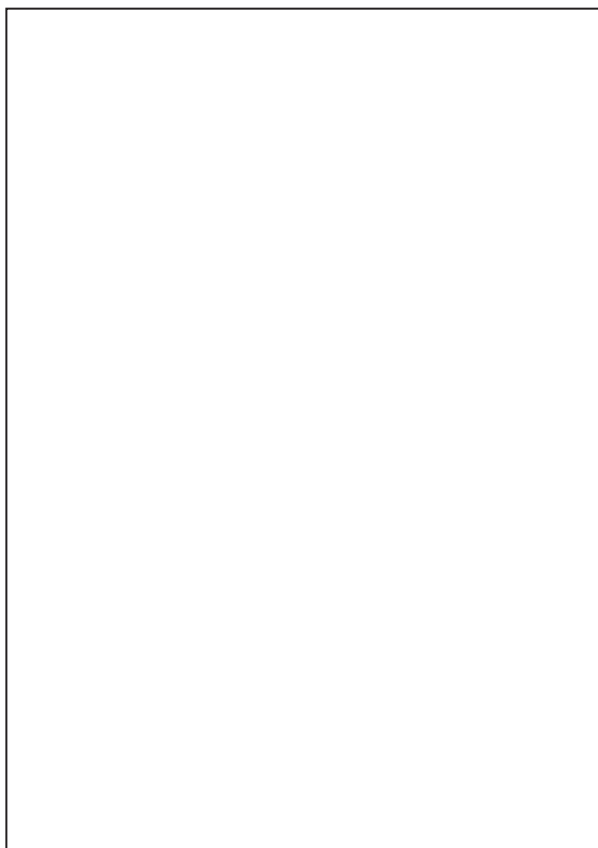
\_\_\_\_\_ protects flower buds

\_\_\_\_\_ supports the anther

\_\_\_\_\_ attract insects with color

\_\_\_\_\_ connects the stigma and ovary

\_\_\_\_\_ releases the pollen



2. Describe the process of pollination in detail.

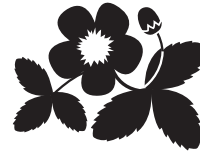
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# Estructura de la Planta Hoja de Trabajo



Instrucciones:

1. Localice un negocio de flores que esté cerca de su escuela. Examine la textura y los colores de las hojas, los tallos y los pétalos de las plantas. Conteste lo siguiente:

- a. Dibuje y rotule la planta del cuadrado que está abajo.
- b. Indique la parte que corresponda a la función de la derecha.

\_\_\_\_\_

donde ocurre la fotosíntesis

\_\_\_\_\_

se convierte en fruta

\_\_\_\_\_

absorbe nutrientes

\_\_\_\_\_

recibe el polen

\_\_\_\_\_

da soporte a flores y hojas

\_\_\_\_\_

protege los capullos de las flores

\_\_\_\_\_

da soporte a la antera (órgano masculino, contiene el polen)

\_\_\_\_\_

atrae insectos con su color

\_\_\_\_\_

conecta el estigma con el ovario

\_\_\_\_\_

expele el polen

2. Describa en detalles el proceso de polinización.

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# Planting

## **SUMMARY**

Students study adaptations of plants and compare and contrast the essential functions that these adaptations serve. Students plant a restoration site.

## **TIME**

2.5 hours

30 minutes for preparation

## **MATERIALS**

- Picks
- Meter-wheel
- Clipboards
- Plant adaptation cards
- Restoration Cycle (visual aid)
- Journal entry questions
- GGNRA Work Performed Data Sheet (copies provided by NPS Natural Resources)
- Gloves
- Plants
- Pencils

# Program

## **Welcome - 5 minutes**

- Park staff welcome students to the park. Using the Restoration Cycle visual aid, park staff ask the students to point out what step in the restoration cycle they think they will perform today.
- Park staff explain the planting project.
- They ask the students why revegetation is important. (The hope is that after establishing an indigenous plant community, various native animals will return, including many birds, insects, pocket gophers, alligator lizards, and skunks.)

## **Small Group Activity - 15 minutes**

- The class divides into groups of 2 or 3 students.
- Each group receives a plant and a matching plant card with a plant adaptation on the back. Plant adaptations might include small leaves, sticky leaves, low-grow-

ing foliage, light green-grey colored plant, etc. The students attempt to figure out why a plant would develop the adaptation. (Small leaves help the plant conserve water in sunny habitats, sticky leaves deter pests, low-growing foliage helps a plant survive a windy environment, light green-grey coloration helps reflect sunlight in sunny habitats, etc.)

- Each group introduces their plant and adaptation to another group.
- Staff help students understand that different adaptations may serve the same function such as conserving water in a sunny habitat.

#### **Spread Plants - 10 minutes**

- Students are introduced to the species that their group will be planting.
- Park staff explain the basics of plant spacing and ask the students to work in pairs to properly space the plants throughout the planting area.

#### **Planting - 1 hour, 15 minutes**

- Park staff give a planting demonstration and explain pick safety rules.

Plants can survive rough handling, but will always respond better if handled with care. Transplanting can disturb root systems: Roots are the principal pathway by which plants take up water and nutrients, and any damage to the fragile root hairs will reduce the plant's ability to feed itself. Once planted in its natural habitat, the plant will not be watered or given fertilizer. Therefore, the bigger and healthier the root system, the better the plant will be able to remove water and nutrients available in the soil. One moment of rough or poor handling can ruin months of careful preparatory work in the nursery!

- Students and staff plant.

#### **Data Sheet - 10 minutes**

- Each group completes the GGNRA Work Performed Data Sheet.

#### **Optional Activity - 30 minutes**

Plant-walk activity (to be done if planting is completed early).

Each One Teach One:

- Park staff divide students into pairs.
- One staff member remains with the class at the starting point for the activity and sends each pair of students down the path at two-minute intervals.

- The first pair of students (Pair 1) goes with a second staff member into the planting area.
- Park staff help the first pair identify a plant, review its name, and learn one adaptation or indigenous use.
- Pair 1 remain at their plant and introduce it to Pair 2.
- Pair 2 proceeds down the path with the second staff member to the next plant; they review the name and information for the second plant.
- In the meantime, Pair 1 introduces Pair 3 to the first plant. This continues until all the groups are standing next to a plant.
- Pair 1 begins to walk along the chain, learning about each plant from the other students.
- Pair 2 follows, then Pair 3, etc., until the entire class has gathered at the other end of the plant walk.

The staff member who is with the class at the beginning of the activity can have each student name two important things about revegetation while they are waiting to begin down the path. The staff member who is with the class at the end of the activity can have the students write the names of two plants and adaptations (other than the one they taught) on a piece of paper. The staff member uses these notes to review adaptations with the class once everyone has finished (the last few students to finish won't need to write).

### **Closing Circle - 5 minutes**

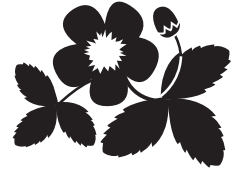
- Staff and students form a circle.
- Staff review adaptations and functions with the class, emphasizing that different adaptations serve the same function for different plants. All plants have some method to regulate water loss, protect themselves from weather and insects, and disperse their seeds. Park staff thank the class for their hard work during the planting.

### **Journal**

Students complete journal entry questions as homework.

# Planting

## Journal Entry



1. Name three plants that you worked with today.

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2. Describe a few characteristics of each plant (for example, "Beach Strawberry has dark green, waxy leaves.").

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3. How are the plants alike? What features do they have in common?

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4. What environmental factor (or factors) forced these plants to adapt similar structures?

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5. What questions do you have about plant adaptations and the functions they serve for plants?

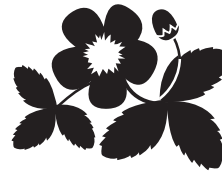
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# Trabajo con Plantas

Preguntas para el Diario



1. Nombre tres plantas con las que trabajó hoy.

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2. Describa algunas características de cada planta (por ejemplo, la Fresa Playera tiene hojas enceradas color verde oscuro).

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3. ¿Qué tienen de similar estas plantas? ¿Qué características tienen en común?

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4. ¿Qué factor (o factores) ambientales forzaron estas plantas a adaptarse creando estructuras similares?

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5. ¿Qué preguntas tiene usted sobre las adaptaciones de las plantas y las funciones que estas desempeñan?

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# Plant Quilt

## **SUMMARY**

Using the Plant Guide on the National Park Labs web site and additional research, students create a “quilt” depicting different ways cultures view and use plants.

## **TIME**

50 minutes on Day 1

35 minutes on Day 2

30 minutes for preparation

## **MATERIALS**

- Old magazines      ‣ Glue
- Scissors              ‣ Tape
- 12" x 12" squares of white paper
- 14" x 14" squares of construction paper (various colors)
- Computers with Internet access
- Additional research material on cultural uses of plants

# Program

## **Day 1**

### **Introduction - 10 minutes**

Students brainstorm about how different cultures view and use plants. (For some cultures, certain plants are food or medicine while for others they are not. Some cultures use plants ornamentally; some use them for religious ceremonies. Plants that are considered weeds for some people are desirable for others.) Teacher prompts the students to think about plants from various viewpoints.

### **Small group activity - 35 minutes**

Students divide into small groups. Each group receives a piece of the white paper. Using images and ideas from the National Park Labs web site ([www.nps.gov/goga/parklabs](http://www.nps.gov/goga/parklabs)), the resource material, and the magazines, they begin creating a quilt square depicting what they understand as one culture's view of a particular plant.

### **Clean up - 5 minutes**

Students clean up; teacher tells them that they must be ready with their quilt square by the beginning of the next class session.

**Day 2**

**5 minutes**

Each group glues its completed quilt square onto a piece of the construction paper.

**10 minutes**

The entire class places the squares together in the shape of a quilt. Once the class agrees on the arrangement of the squares, the class tapes the squares together.

**20 minutes**

The class hangs the quilt on the classroom wall. Each group describes its square to the other students.

# Creating a Community Garden

## **SUMMARY**

This is an optional lesson for classes that wish to extend the planting module. Students write a proposal that suggests a site for a community garden on their school grounds. The proposal identifies users of the space and their needs, depicts plans for a space that can meet these needs, and specifies the work involved in transforming the site.

## **TIME**

50 minutes

10 minutes for preparation

## **MATERIALS**

- Community Garden Planning Questions
- Tape measures (one for each group)

## Lesson

### **Introduction - 5 minutes**

Teacher explains to the students that they are going to create a proposal for a community garden at their school. The first step is to think about what kind of garden would serve their community. Students should refer to the research they did for the Plant Quilt. Who lives in their neighborhood? How do they view plants?

### **Small Group Activity - 15 minutes**

Students choose a site for the garden. What factors will be involved in choosing the site? (Accessibility to the users, not disruptive to the traffic patterns of people walking from class to class, quality of soil in the area.)

Teacher divides the students into groups of four or five. Each group goes out onto the school grounds and chooses a proposed site for their community garden. The group measures the parameter of the site. The groups return to the classroom.

### **Planning Questions - 25 minutes**

Distribute one copy of the Community Garden Planning Questions to each group. Groups complete the planning questions.



**Discussion - 5 minutes**

The class discusses planning issues. What were the hardest decisions to make in the planning process? What were the easiest? Did groups consider issues of equal access? Does it matter if all students, teachers, and community members have equal access to the resource they are creating?

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**Extension to Optional Post-visit Lesson**  
**Creating a Community Garden**

Students and teachers may extend this lesson by actually creating and maintaining the garden. We strongly urge teachers to seek assistance before beginning a school garden.

For technical, logistical, and educational support contact:

School Garden Coordinator  
San Francisco League of Urban Gardeners (SLUG).  
Phone: (415) 285-7584  
Voice mail: (415) 255-4497  
Fax: (415) 285-7586

# Community Garden

## Planning Questions



1. What cultures are represented in the residents who surround your school?

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2. Are there any plants that might be of particular interest to these residents?

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3. List the plants you want to plant in your garden.

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4. Will you grow your plants from cuttings or seeds? Why?

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5. What are the dimensions of your site? \_\_\_\_\_

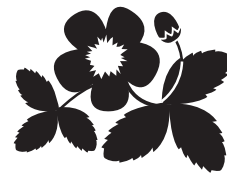
6. On a separate sheet of paper, draw your site. Show the types of plants and the location of each plant.

7. Who will be responsible for the upkeep of your garden? List what will need to be done to keep your garden healthy. How often will these tasks need to be done?

8. On a separate piece of paper, write a proposal for this garden that could be submitted to the principal of your school. You should include all the details about how the garden will be created and maintained as well as the benefits it will provide. Good luck!

# Jardín Comunitario

## Preguntas sobre Planificación



1. ¿Qué culturas están representadas entre los residentes que viven alrededor de su escuela?

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2. ¿Hay algunas plantas que puedan ser de interés particular para estos residentes?

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3. ¿Indique las plantas que usted quiere sembrar en su jardín?

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4. ¿Qué va a utilizar para cultivar sus plantas, ¿estolones o semillas? ¿Por qué?

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5. ¿Cuáles son las dimensiones de su área? \_\_\_\_\_

6. Dibuje su área en una hoja de papel separada. Ilustre los tipos de plantas y la localización de cada planta.

7. ¿Quién será responsable del mantenimiento de su jardín? Indique que es necesario hacer para mantener saludable su jardín. ¿Con que frecuencia deben realizarse estas tareas?

8. En una hoja de papel separada escriba una propuesta para este jardín que pueda someterse al principal de su escuela. Usted debe incluir todos los detalles sobre cómo se creará y mantendrá el jardín y qué beneficios proveerá. ¡Buena Suerte!

# Rubric

## Planting

### Science (Structure and Function)

*Needs Improvement:* Students can describe one or two plants, but cannot compare or group plant parts with similar functions.

*Good:* Students can compare two plants and find parts with similar functions.

*Excellent:* Students can compare three or more plants, pointing out structures with specific functions and adaptations for the environment.

### Environmental Justice (Equal access)

*Needs Improvement:* Students do not understand that various groups of people view plants and nature differently.

*Good:* Students understand that various groups of people view plants and nature differently but make no attempt to understand why.

*Excellent:* Students understand that various groups of people view plants and nature differently and they realize that these views are shaped by heredity, culture, and personal experience.

### Life Skills (Cooperative Learning)

*Needs Improvement:* Students show incomplete interaction, often ignore comments, group efforts are easily sidetracked, some members uninvolved in group.

*Good:* More than half the members are actively involved, comments are rarely ignored, rarely stray from topic.

*Excellent:* All students participate equally, actively listen to one another, show respect for ideas, stay on task.